

DOCKET NO: 284854US0PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :  
GEORGES MOINEAU, ET AL. : EXAMINER: COONEY, JOHN M.  
SERIAL NO: 10/566,654 :  
FILED: FEBRUARY 1, 2006 : GROUP ART UNIT: 1765  
FOR: POLYURETHANE FOAM, :  
METHOD FOR THE PRODUCTION AND  
USE THEREOF

APPEAL BRIEF

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

Further to the April 20, 2011 Notice of Appeal, this is an Appeal from the December 20, 2010 Office Action.

**I. REAL PARTY IN INTEREST**

The real party in interest in this appeal is Saint-Gobain Performance Plastics  
Chaineux, Chaineux, Belgium.

## **II. RELATED APPEALS AND INTERFERENCES**

Appellants, Appellants' legal representative and the assignee are aware of no appeals, interferences, or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

## **III. STATUS OF CLAIMS**

Claims 1-9, 11-18, and 20-25 are pending and stand rejected.

Claims 10 and 19 have been cancelled.

The rejections of claims 1-9, 11-18, and 20-25 are being appealed.

## **IV. STATUS OF AMENDMENTS**

No Amendment After Final Rejection was filed.

## **V. SUMMARY OF CLAIMED SUBJECT MATTER**

Independent claim 1 is directed to a water-impermeable flexible polyurethane foam. *See* present specification, page 3, lines 9 to 10; claim 1. The foam is obtained by reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent. *See* present specification, page 3, lines 10 to 12; claim 1. The polyol component comprises at least one hydrophobic polyol. *See* present specification, page 3, lines 10 to 11; claim 1. The polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-

bis(phenylisocyanate) isomer (2,4'MDI). *See* present specification, page 5, lines 28 to 31; claim 1. The foam has a compression force of less than or equal to 12 kPa for 50% compression. *See* present specification, page 3, lines 12 to 14; claim 1. A molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than 0.90. *See* present specification, page 4, lines 26 to 28; claim 1. Claims 2-9, 11-18, 20, and 21 depend directly or indirectly from claim 1. *See* claims 2-9, 11-18, and 20.

Independent claim 22 is directed to a water-impermeable flexible polyurethane foam. *See* present specification, page 3, lines 9 to 10; claim 22. The foam is obtained by reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent. *See* present specification, page 3, lines 10 to 12; claim 22. The polyol component comprises at least one hydrophobic polyol. *See* present specification, page 3, lines 10 to 11; claim 22. The polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI). *See* present specification, page 5, lines 28 to 31; claim 22. The polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) isomer (4,4'MDI). *See* present specification, page 5, lines 19 to 28; claim 22. The foam has a compression force of less than or equal to 12 kPa for 50% compression. *See* present specification, page 3, lines 12 to 14; claim 22. A molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than 0.90. *See* present specification, page 4, lines 26 to 28; claim 22.

Independent claim 23 is directed to a water-impermeable flexible polyurethane foam. *See* present specification, page 3, lines 9 to 10; claim 23. The foam is obtained by reacting a polyol component with at least one polyisocyanate component in the presence of a foaming

agent. *See* present specification, page 3, lines 10 to 12; claim 23. The polyol component comprises at least one hydrophobic polyol. *See* present specification, page 3, lines 10 to 11; claim 23. The polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI). *See* present specification, page 5, lines 28 to 31; claim 23. The foam has a compression force of less than or equal to 12 kPa for 50% compression. *See* present specification, page 3, lines 12 to 14; claim 23. A molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than or equal to 0.85. *See* present specification, page 4, lines 26 to 28; claim 23.

Independent claim 24 is directed to a water-impermeable flexible polyurethane foam. *See* present specification, page 3, lines 9 to 10; claim 24. The foam is obtained by reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent. *See* present specification, page 3, lines 10 to 12; claim 24. The polyol component comprises at least one hydrophobic polyol. *See* present specification, page 3, lines 10 to 11; claim 24. The polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI). *See* present specification, page 5, lines 28 to 31; claim 24. The polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) isomer (4,4'MDI). *See* present specification, page 4, lines 26 to 28; claim 24. The foam has a compression force of less than or equal to 12 kPa for 50% compression. *See* present specification, page 3, lines 12 to 14; claim 24. A molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than or equal to 0.85. *See* present specification, page 4, lines 26 to 28; claim 24.

Independent claim 25 is directed to a water-impermeable flexible polyurethane foam. *See* present specification, page 3, lines 9 to 10; claim 25. The foam is obtained by reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent. *See* present specification, page 3, lines 10 to 12; claim 25. The polyol component comprises at least one hydrophobic polyol. *See* present specification, page 3, lines 10 to 11; claim 25. The polyol component has a functionality of from 2.1 to 2.3. The polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI). *See* present specification, page 5, lines 28 to 31; claim 25. The polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) isomer (4,4'MDI). *See* present specification, page 4, lines 26 to 28; claim 25. The polyisocyanate component has a functionality of from 2.1 to 2.3. *See* present specification, page 4, lines 23 to 25; claim 25. A The foam has a compression force of less than or equal to 12 kPa for 50% compression. *See* present specification, page 3, lines 12 to 14; claim 25. A molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than 0.90. *See* present specification, page 4, lines 26 to 28; claim 25.

## **VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

### **A. Rejection Under 35 U.S.C. §103**

Claims 1-9, 11, 12, and 20-25 are rejected under 35 U.S.C. §103(a) over U.S. Patent No. 4,264,743 to Maruyama et al. ("Maruyama") in view of U.S. Patent No. 5,521,226 to Bleys ("Bleys").

**B. Rejection Under 35 U.S.C. §103**

Claims 13-18 under 35 U.S.C. §103(a) over Maruyama in view of Bleys and U.S. Patent No. 4,386,166 to Peterson et al. ("Peterson").

**VII. ARGUMENT**

Appellants submit that the outstanding rejections should be reversed for the following reasons.

**A. Rejection Under 35 U.S.C. §103**

As indicated above, claims 1-9, 11, 12, and 20-25 are rejected as obvious over Maruyama in view of Bleys.

**1. Claim 1**

Claim 1 recites "[a] water-impermeable flexible polyurethane foam obtained by: reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent; wherein: the polyol component comprises at least one hydrophobic polyol; the polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI); the foam has a compression force of less than or equal to 12 kPa for 50% compression; and a molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than 0.90" (emphasis added). Maruyama and Bleys do not disclose or suggest such a foam.

Claim 1 requires that the foam has an "index" (NCO/OH molar ratio) of less than 0.90. The Examiner relies on Maruyama for its disclosure of a flexible polyurethane foam that is formed by reacting a hydrophobic polyol with an isocyanate in the presence of a blowing agent. *See* December 20, 2010 Office Action, page 2; Maruyama, column 14, lines 57 to 66. The Examiner concedes that Maruyama does not disclose a foam having the "index" recited in claim 1, but asserts that it would have been obvious to modify the foams of Maruyama to obtain indices as required in claim 1, stating:

However, the reference specifically identifies preferred values for approaching the Index values of applicants' claims and identifies benefits and weaknesses, respectively, associated with operating within and beyond the preferred ranges of the instant claims (column 8 lines 24-32). Accordingly, it would have been obvious for one having ordinary skill in the art to have operated at ratios of Index values below the preferred ratios of Maruyama et al.'s disclosure if one were not interested in the good contact angle with water afforded to products having fuller reaction of available hydroxyl groups for the purpose of obtaining acceptable products having residual hydroxyl functionality in order to arrive at the products and processes of applicants' claims with the expectation of success in the absence of a showing of new or unexpected results.

*See* December 20, 2010, Office Action, page 3. Appellants respectfully disagree.

Maruyama, which is discussed in the present specification (*see* page 2, line 22 to page 3, line 6) discloses that:

The ratio of the polyisocyanate to the active hydrogen of the foaming compound (NCO/OH index) must be 0.9 or higher. If this value is lower than 0.9, the hydroxyl groups remaining in the foamed product will lower the contact angle between the polymer and water.

*See* Maruyama, column 8, lines 24 to 29 (emphasis added). Maruyama is not stating a preference, as asserted by the Examiner, but instead a requirement for practicing the disclosed invention. Maruyama explicitly indicates that employing indices of less than 0.90

(i.e., the range of indices required in claim 1) provide undesirable results. One of ordinary skill in the art would not have been led to modify the disclosed foam to have an index of less than 0.90 -- instead, such skilled artisan would have been led away from such a modification. See MPEP §2142.02 (citing *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 220 USPQ 303 (Fed. Cir. 1983)) ("A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.").

Claim 1 further requires a polyisocyanate component including at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI). The Examiner concedes that Maruyama does not disclose employing such an isocyanate component, but asserts that it would have been obvious to use such an isocyanate component in view of the teachings of Bleys. See Office Action, page 4; Bleys, column 2, lines 41 to 48. Appellants again disagree.

Maruyama and Bleys are directed to different foams having different compositions and properties. That particular isocyanate compositions might provide desirable performance in the foams of Bleys does not suggest that such isocyanate compositions would also provide desirable performance in the foams of Maruyama, in the absence of further direction in the prior art. As discussed in the present specification, employing at least 30 mol% of 2,4'MDI to prepare the polyurethane foam of claim 1 breaks the crystallinity of hard segments of the polyurethane. See present specification, page 5, lines 28 to 31. Bleys does not suggest using the particular amount of the particular isocyanate recited in claim 1 in the foams of Maruyama, and the cited references do not recognize the benefits stemming therefrom.

For the reasons discussed above, a *prima facie* case of obviousness has not been made. However, even if a *prima facie* case were made, such case is rebutted by the results



shown in the present specification – "[a] *prima facie* case of obviousness ... is rebuttable by proof that the claimed compounds possess unexpectedly advantageous or superior properties." See MPEP §2144.09 (citing *In re Papesch*, 315 F.2d 381 (C.C.P.A. 1963)). The Examples of the present specification demonstrate that, for foams of similar density, foams according to claim 1 (Examples 1 to 5) provide lower compression force and/or superior water impermeability to foams according to Maruyama (Comparative Examples 1 and 2 -- as discussed in the present specification, SUPERSHEET and SUPERSEAL are examples of products according to Maruyama -- see page 3, lines 1 to 6). See present specification, Table 1. These results are objective evidence of the improvements of the foam of claim 1 over known foams as in Maruyama, and thus these results rebut any suggestion that it would have been obvious to modify the foams of Maruyama as proposed in the Office Action (e.g., to change the index and/or to use the isocyanates of Bleys).

Claim 1 would not have been rendered obvious by Maruyama and Bleys. Claims 2-9, 11, 12, 20 and 21 depend from claim 1 and, thus, also would not have been rendered obvious by Maruyama and Bleys. Accordingly, reversal of the rejection is respectfully requested.

2. Claim 22

Claim 22 recites "[a] water-impermeable flexible polyurethane foam obtained by: reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent; wherein: the polyol component comprises at least one hydrophobic polyol; the polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI); the polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) isomer (4,4'MDI); the foam has a compression force of less

than or equal to 12 kPa for 50% compression; and a molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than 0.90" (emphasis added). Maruyama and Bleys do not disclose or suggest such a foam.

Claim 22 requires a polyisocyanate component comprising at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI) and an index of less than 0.90 and, thus, distinguishes over Maruyama and Bleys for at least the reasons discussed above with respect to claim 1.

Claim 22 further requires that the polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) isomer (4,4'MDI). The Examiner does not articulate how this feature, taken with the other features of claim 22, would have been rendered obvious by Maruyama and Bleys. Maruyama does not disclose employing such an isocyanate component. Although such an isocyanate component is disclosed in Bleys, Bleys does not suggest using such an isocyanate component in the foam of Maruyama, much less in combination with the other features required in claim 22.

Claim 22 would not have been rendered obvious by Maruyama and Bleys. Accordingly, reversal of the rejection is respectfully requested.

3. Claim 23

Claim 23 recites "[a] water-impermeable flexible polyurethane foam obtained by: reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent; wherein: the polyol component comprises at least one hydrophobic polyol; the polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-

bis(phenylisocyanate) isomer (2,4'MDI); the foam has a compression force of less than or equal to 12 kPa for 50% compression; and a molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than or equal to 0.85" (emphasis added). Maruyama and Bleys do not disclose or suggest such a foam.

Claim 23 requires a polyisocyanate component comprising at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI) and an index of less than 0.85 and, thus, distinguishes over Maruyama and Bleys for at least the reasons discussed above with respect to claim 1.

As indicated above, claim 23 requires an even lower index than recited in claim 1 and, thus, requires a range of indices even further outside of the required range of indices of the foams of Maruyama.

Claim 23 would not have been rendered obvious by Maruyama and Bleys. Accordingly, reversal of the rejection is respectfully requested.

4. Claim 24

Claim 24 recites "[a] water-impermeable flexible polyurethane foam obtained by: reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent; wherein: the polyol component comprises at least one hydrophobic polyol; the polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI); the polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) isomer (4,4'MDI); the foam has a compression force of less than or equal to 12 kPa for 50% compression; and a molar ratio of isocyanate functional

groups to a total of alcohol functional groups and reactive functional groups (the index) is less than or equal to 0.85" (emphasis added). Maruyama and Bleys do not disclose or suggest such a foam.

Claim 24 requires a polyisocyanate component comprising at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI) and an index of less than 0.85 and, thus, distinguishes over Maruyama and Bleys for at least the reasons discussed above with respect to claim 1.

Claim 24 further requires that the polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) isomer (4,4'MDI). The Examiner does not articulate how this feature, taken with the other features of claim 24, would have been rendered obvious by Maruyama and Bleys. Maruyama does not disclose employing such an isocyanate component. Although such an isocyanate component is disclosed in Bleys, Bleys does not suggest using such an isocyanate component in the foam of Maruyama, much less in combination with the other features required in claim 24.

Also, claim 24 requires an even lower index than recited in claim 1 and, thus, requires a range of indices even further outside of the required range of indices of the foams of Maruyama.

Claim 24 would not have been rendered obvious by Maruyama and Bleys. Accordingly, reversal of the rejection is respectfully requested.

5. Claim 25

Claim 25 recites "[a] water-impermeable flexible polyurethane foam obtained by: reacting a polyol component with at least one polyisocyanate component in the presence of a

foaming agent; wherein: the polyol component comprises at least one hydrophobic polyol; the polyol component has a functionality of from 2.1 to 2.3; the polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI); the polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) isomer (4,4'MDI); the polyisocyanate component has a functionality of from 2.1 to 2.3; the foam has a compression force of less than or equal to 12 kPa for 50% compression; and a molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than 0.90" (emphasis added). Maruyama and Bleys do not disclose or suggest such a foam.

Claim 25 requires a polyisocyanate component comprising at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI) and an index of less than 0.90 and, thus, distinguishes over Maruyama and Bleys for at least the reasons discussed above with respect to claim 1.

Claim 25 further requires that the polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) isomer (4,4'MDI). Maruyama does not disclose employing such an isocyanate component. The Examiner does not articulate how this feature, taken with the other features of claim 25, would have been rendered obvious by Maruyama and Bleys. Although such an isocyanate component is disclosed in Bleys, Bleys does not suggest using such an isocyanate component in the foam of Maruyama, much less in combination with the other features required in claim 25.

Claim 25 also requires that the polyisocyanate component has a functionality of from 2.1 to 2.3. The Examiner does not articulate how this feature, taken with the other features of claim 25, would have been rendered obvious by Maruyama and Bleys. Neither Maruyama

nor Bleys discloses or suggests an isocyanate component having the particular and specific range functionalities encompassed by claim 25.

Claim 25 would not have been rendered obvious by Maruyama and Bleys.

Accordingly, reversal of the rejection is respectfully requested.

**B. Rejection Under 35 U.S.C. §103**

As indicated above, claims 13-18 are rejected as obvious over Maruyama in view of Bleys and Peterson.

For the reasons discussed above, Maruyama and Bleys fail to disclose or suggest each and every feature of claim 1. Peterson does not remedy the deficiencies of Maruyama and Bleys. Peterson is cited for its alleged disclosure of manufacturing foams by casting on a conveyor belt and passing the belt through an oven. *See* December 20, 2010 Office Action, page 5. However, Peterson, like Maruyama and Bleys, fails to disclose or suggest a foam including the particular combination of features recited in claim 1. Accordingly, the combination of references fails to disclose or suggest each and every feature of claim 1.

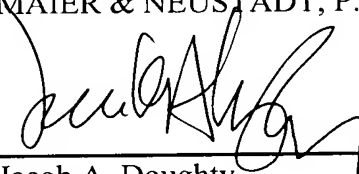
Claim 1 would not have been rendered obvious by Maruyama, Bleys, and Peterson. Claims 13-18 depend from claim 1 and, thus, also would not have been rendered obvious by Maruyama, Bleys, and Peterson. Accordingly, reversal of the rejection is respectfully requested.

**VIII. CONCLUSION**

For the above reasons, it is respectfully requested that all outstanding rejections of the pending claims be REVERSED.

Respectfully submitted,

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**CLAIMS APPENDIX**

Claim 1 (Previously Presented): A water-impermeable flexible polyurethane foam obtained by:

reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent;

wherein:

the polyol component comprises at least one hydrophobic polyol;

the polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI);

the foam has a compression force of less than or equal to 12 kPa for 50% compression; and

a molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than 0.90.

Claim 2 (Previously Presented): The polyurethane foam as claimed in claim 1, wherein the compression force is from around 8 to 12 kPa for 50% compression.

Claim 3 (Previously Presented): The polyurethane foam as claimed in claim 1, wherein the foam has a density not exceeding 150 kg/m<sup>3</sup>.

Claim 4 (Previously Presented): The polyurethane foam of claim 1, wherein at least one of the polyol component and the polyisocyanate component has a functionality greater than 2.



Claim 5 (Previously Presented): The polyurethane foam of claim 1, wherein the isocyanate index is less than or equal to 0.85.

Claim 6 (Previously Presented): The polyurethane foam of claim 1, wherein the polyol component is reacted with the polyisocyanate component in the presence of a monofunctional alcohol or amine component.

Claim 7 (Previously Presented): The polyurethane foam of claim 1, wherein the hydrophobic polyol comprises a fatty hydrocarbon chain.

Claim 8 (Previously Presented): The polyurethane foam as claimed in claim 7, wherein the hydrophobic polyol is derived from a fatty acid dimer.

Claim 9 (Previously Presented): The polyurethane foam of claim 1, wherein the polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) (4,4'MDI).

Claim 10 (Cancelled).

Claim 11 (Previously Presented): The polyurethane foam of claim 1, wherein the foaming agent comprises water.

Claim 12 (Previously Presented): The polyurethane foam of claim 1, wherein the foam is obtained in the presence of at least one additive having at least one reactive functional group that reacts with the polyisocyanate component or with the polyol component.

Claim 13 (Previously Presented): A process for manufacturing the polyurethane foam as claimed in claim 1, comprising:

preparing a reaction mixture comprising the polyol component, the polyisocyanate component and the foaming agent;

casting the reaction mixture on a conveyor belt; and

running the conveyor belt and the cast mixture through a crosslinking oven.

Claim 14 (Previously Presented): The process as claimed in claim 13, further comprising:

depositing an upper protective film on the cast mixture;

wherein running the conveyor belt and the cast mixture comprises running the conveyor belt and the cast mixture coated with the upper protective film through the crosslinking oven.

Claim 15 (Previously Presented): The process of claim 14, further comprising casting a lower protective film on the conveyor belt before casting the reaction mixture on the conveyor belt.

Claim 16 (Previously Presented): The process of claim 15, wherein at least one of the lower protective film and the upper protective film comprises an adhesive provided on a surface that contacts the reaction mixture.

Claim 17 (Previously Presented): The process of claim 15, further comprising:  
removing the lower protective film and/or the upper protective film; and  
attaching a further film comprising an adhesive to a free surface of the foam strip.

Claim 18 (Previously Presented): A process for manufacturing the polyurethane foam as claimed in claim 1, comprising:

preparing a reaction mixture comprising the polyol component, the polyisocyanate component and the foaming agent;

injection or casting the reaction mixture in a closed or open mold; and  
crosslinking the mixture in the mold.

Claim 19 (Canceled).

Claim 20 (Previously Presented): The polyurethane foam as claimed in claim 2, wherein the polyurethane foam has a density not exceeding  $150 \text{ kg/m}^3$ .

Claim 21 (Previously Presented): The polyurethane foam as claimed in claim 1, wherein the polyurethane foam has a density not exceeding  $60 \text{ kg/m}^3$ .

Claim 22 (Previously Presented): A water-impermeable flexible polyurethane foam obtained by:

reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent;

wherein:

the polyol component comprises at least one hydrophobic polyol;

the polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI);

the polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) isomer (4,4'MDI);

the foam has a compression force of less than or equal to 12 kPa for 50% compression; and

a molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than 0.90.

Claim 23 (Previously Presented): A water-impermeable flexible polyurethane foam obtained by:

reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent;

wherein:

the polyol component comprises at least one hydrophobic polyol;

the polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI);

the foam has a compression force of less than or equal to 12 kPa for 50% compression; and

a molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than or equal to 0.85.

Claim 24 (Previously Presented): A water-impermeable flexible polyurethane foam obtained by:

reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent;

wherein:

the polyol component comprises at least one hydrophobic polyol;

the polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI);

the polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) isomer (4,4'MDI);

the foam has a compression force of less than or equal to 12 kPa for 50% compression; and

a molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than or equal to 0.85.

Claim 25 (Previously Presented): A water-impermeable flexible polyurethane foam obtained by:

reacting a polyol component with at least one polyisocyanate component in the presence of a foaming agent;

wherein:

the polyol component comprises at least one hydrophobic polyol;

the polyol component has a functionality of from 2.1 to 2.3;

the polyisocyanate component comprises at least 30 mol% of 2,4'-methylene-bis(phenylisocyanate) isomer (2,4'MDI);

the polyisocyanate component comprises 4,4'-methylene-bis(phenylisocyanate) isomer (4,4'MDI);

the polyisocyanate component has a functionality of from 2.1 to 2.3;

the foam has a compression force of less than or equal to 12 kPa for 50% compression; and

a molar ratio of isocyanate functional groups to a total of alcohol functional groups and reactive functional groups (the index) is less than 0.90.

**EVIDENCE APPENDIX**

None.

**RELATED PROCEEDINGS APPENDIX**

None.